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Petite Amateur Navy Satellite Frequently Asked Questions

Monterey, California. Naval Postgraduate School

Space Systems Academic Group

Petite Amateur Navy Satellite

Frequently Asked Questions

Why build PANSAT?

The objectives of the PANSAT project are the following: (1) To enhance the education of military officers at the Naval Postgraduate School through the development and operation of a spread spectrum, digital communication satellite; (2) To demonstrate the capability of a low-cost, packetized, spread spectrum system to enhance military communication using a small satellite platform; and, (3) To provide store-and-forward communication using direct sequence, spread spectrum modulation for the amateur radio community.

Why and how will PANSAT be launched from the Space Shuttle?

PANSAT will be launched from the Space Shuttle as a secondary payload through the NASA Hitchhiker Program. The Hitchhiker program was established to allow for low-cost and quick-reaction accommodation of secondary payloads on the Space Shuttle. The Hitchhiker carriers can carry payloads side mounted in the Shuttle payload bay or mounted on a cross-bay "bridge" structure.

PANSAT will be mounted within a canister, attached to a small spring loaded ejection mechanism. When the Shuttle is positioned at the appropriate orbital position pyrotechnic bolts will fire releasing the satellite. This ejection mechanism will impart an approximate delta V of 3.5 feet per second.

When will PANSAT be launched?

PANSAT was integrated as part of the 3rd International Extreme Ultraviolet Hitchhiker (IEH-3) payload which flew onboard the Discovery Shuttle on STS-95. Launch date was 29 October 1998. PANSAT was deployed on Friday, 30 Oct. 1998, 23 hours and 26 minutes into the mission at 10:46 AM PST. The orbit for PANSAT is at 28.46 deg inclination in a nearly circular, 563 km x 552 km altitude orbit.

What is the mission life of PANSAT?

PANSAT was designed for a mission life of two years, but current estimates place its operational life at four to six years. This depends almost entirely on the altitude which will determine the amount of atmospheric drag on the satellite. Current predictions put PANSAT deploy in a circular, 300 nmi (555 km) altitude orbit.

Once it is ejected from the Space Shuttle PANSAT will begin to fall back to the earth. At the end of its orbital lifetime, PANSAT will burn up as it reenters the Earth's atmosphere.

What type of attitude control does PANSAT use?

PANSAT is a tumbling satellite and does not use any attitude control or propulsion. By using an omnidirectional antenna and placing solar cells on each face of the satellite PANSAT will functional regardless of its orientation with respect to earth.

How is PANSAT powered?

PANSAT has a total of eighteen solar panels attached to its outer surface. Seventeen of these panels consist of silicon solar cells. The eighteenth solar panel is made of gallium-arsenide (GaAs) solar cells. The high-efficiency GaAs cells are used on the 18th panel due to area limitations. The silicon solar panels are square with dimensions of 7" x 7" while the GaAs panel is circular with a diameter of 5.75". The eighteen solar panels are connected to the Electrical Power Subsystem (EPS) in parallel. The EPS stores power in two batteries. Each battery consists of nine, commercial nickel-cadmium cells.

Will this satellite be available for amateur communications? That is will you make the despread bit stream available to others?

Yes, PANSAT will be available to the amateur radio community. The pseudo-noise (PN) code used for spreading is one of the already approved codes for amateur spread spectrum, using a 7-bit shift register with taps at 7 and 1; and one sequence length per bit of information. Ground stations will need the capability to conduct spread spectrum communications. When the design is completed the specifications needed to communicate with PANSAT will be distributed to prospective users.

What type of facilities are located at NPS? Were the facilities established specifically for the PANSAT project?

An infrastructure of tools and facilities has been compiled to promote the successful completion of the PANSAT project. Machining capabilities are held within the Space Systems Academic Group in the form of a CNC vertical mill, providing short lead times for one-of-a-kind parts. Facilities are also in place for component and subsystem environmental testing. The major testing facilities currently operable include a 500 pound shaker and a 1 cu. ft. thermal-vacuum chamber. We also have an assortment of software tools for mechanical design and test, electronic design, thermal analysis and orbital mechanics. These tools were acquired for use in the academic courses, instructional labs, and on the PANSAT project as well as other SSAG projects such as the Space ThermoAcoustic Refrigerator (STAR).

To submit questions to this page e-mail to dsakoda@nps.navy.mil

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